

Table 17. Continued

Region and Country	Survey					Prevalence* (%)		
	Year	Sample area	Number	Age	Sponsor	Men	Women	Total
Central America [¶]								
Belize	1986	National Drug Use Survey	12,595	10–20	Pride Belize			12 [‡]
Costa Rica	1984	San José	487	15–20	Calderon et al.	17	10	13
Honduras	1986	Preuniversity students	694	15–30	National University	29	4	17
Nicaragua	1988	High school students in Managua	468	15–18	University of Nicaragua	40	52	46
Panama	1984	Nationwide	11,385	11–18	National Cancer Association	10	4	7 ^{**}
	1989	Private college	464	15–19	Department of Health	3	3	6
Mexico	1989	Secondary students	9,967					6 42 [‡]
	1988	First year university students	88,735		National University			9 [‡]
	1980	Mexico City secondary students	3,408		Mexican Institute of Psychiatry			47 [‡]
Latin Caribbean ^{††}								
Cuba	1988	Nationwide	1,067	13–17	Consumer Institute	8	3	6
Selected Caribbean countries								
Bahamas	1987	Areawide	4,838		United Nations Fund for Drug Abuse	20 [‡]	10 [‡]	32 [‡]
		Out-of-school youths	74					
Cayman Islands	1985	In-school youths	4,767		Drug Advisory Committee			15 [‡] 23 [‡]
		Areawide	2,077	10–17				
French Guiana	1986	Areawide		11–13		7 ^{§§}	2 ^{§§}	
Jamaica	1987	Secondary students		11–21	National Council on Drug Abuse	40 7	19 3	29 [‡] 5
Suriname	1988	Seven cities and rural areas				36	12	
Aruba and Netherlands Antilles	1988	Aruba		13–21		24	12	
Trinidad and Tobago	1985	All secondary students	2,192	11–19	Trinidad and Tobago Government Drug Survey	23	12	17 [‡]
U.S. Virgin Islands	1988	Household Behavioral Risk Factor Survey		12–17	U.S. Virgin Islands Government			1

*Given for current daily smokers.

[‡]Smoked during the previous year.[‡]Ever smoked.^{||}Smoked during the previous month.[¶]Excludes El Salvador and Guatemala.^{**}Smoked during the previous week.^{††}Excludes Dominican Republic, Haiti, and Puerto Rico.^{§§}Occasional smoker.

Table 18. Prevalence of smoking among women of childbearing age, selected Latin American and Caribbean countries, 1979–1987

Country	Survey				Prevalence (%)
	Year	Sample area	Number	Sponsor	
Argentina	1987	Nationwide	4,605	CLAP*	38 [†]
Brazil	1981	Southern Brazil		CDC [‡]	25
	1982	Piauí State		CDC	27
	1982	Amazonas State		CDC	22
	1987	Nationwide		CLAP	36
Chile	1983	Santiago			58/26 [§]
Colombia	1987	Nationwide	1,480	CLAP	21
Costa Rica	1986	Nationwide			12
Ecuador	1987	Nationwide	2,009	CLAP	8
Guatemala	1983	Nationwide		CDC	7
	1987	Nationwide	4,187	CLAP	3
Mexico	1979	U.S. border		CDC	19
Panama	1987	Nationwide	986	CLAP	4
Paraguay	1987	Nationwide	1,935	CLAP	7
Puerto Rico	1982	Entire territory			16
Suriname	1985	Urban areas			26
Uruguay	1987	Nationwide	5,169	CLAP	44 [†]
Venezuela	1987	Nationwide	980	CLAP	34

Source: Pan American Health Organization (1992).

*Centro Latinoamericano de Perinatología y Desarrollo Humano de la Organización Panamericana de Salud.

[†]Six months before pregnancy.

[‡]Centers for Disease Control.

[§]Before pregnancy/during pregnancy.

Table 19. Public knowledge and attitudes on smoking and health in Latin America and the Caribbean, 1982–1990

Country	Year	Sample	Question	Response (%)
Bolivia	1983	344 daily smokers	Is smoking dangerous? (yes)	83
	1983	120 adolescents	Is smoking harmful to health? (somewhat or very)	96
	1987	72 physicians	Is smoking harmful to health? (somewhat or very)	94
Brazil	1988	Pôrto Alegre	Is the life expectancy of smokers decreased by smoking? (yes)	48
	1988	Pôrto Alegre	Is environmental tobacco smoke harmful to children? (yes)	100

Table 19. Continued

Country	Year	Sample	Question	Response (%)
Costa Rica	1984	Urban students	Are health risks associated with smoking? (adequate knowledge of such risks)	81
Cuba	1988	Nationwide	Do you approve of a ban on indoor smoking? (yes)	98
Guatemala	1989	Treasury employees	Are health risks associated with smoking? (low level of knowledge)	64/56*
Honduras	1986	Preuniversity students aged 15–30	Does smoking cause lung cancer and other diseases? (yes)	50
	1987	Ministry of Health employees in Tegucigalpa	Do you favor a worksite smoking regulation? (yes)	70
			Are you bothered by smoking at your worksite? (yes)	77
Mexico	1988	Nationwide	Is smoking harmful to health? (yes)	90
	1988	Nationwide	Is smoking less harmful than use of other drugs? (yes)	95
Panama	1989	Students	Are you bothered when other people smoke? (yes)	60
Paraguay	1990	Physicians	Is smoking undesirable? (yes)	30
Peru	1982	Adolescents	Is smoking harmful? (yes)	95
	1989	Adult smokers	What is the most important reason to stop smoking? (health)	66
Puerto Rico	1989	San Juan	Do you believe that smoking is harmful to the health of smokers? (yes)	89
Uruguay	1984	Montevideo	Does smoking affect health negatively? (yes)	81
Venezuela	1984	Nationwide	Is smoking harmful to health? (yes)	94
	1984	Caracas	Should smoking be restricted in public places? (yes)	83
	1984	Nationwide	Should all forms of tobacco advertising be banned? (yes)	72
	1986	Caracas	Is smoking harmful to others? (yes)	75/81*
	1986	Caracas	Are some cigarettes less harmful than others? (yes)	53
	1986	Caracas	Should smoking be restricted in public places? (yes)	89
	1989	Caracas	Should radio and television advertising of tobacco be banned—including indirect advertising? (yes)	60

Source: Pan American Health Organization (1992).

*Smokers/nonsmokers.

Smoking-Attributable Mortality in Latin America and the Caribbean

Introduction

Births and deaths are the most widely collected and reported health events, and mortality is a standard measure of the health status of a population. Mortality has traditionally been used as an indicator of socioeconomic status and standard of living, especially in countries for which measures of economic productivity are inappropriate.

Mortality is a useful measure when setting health priorities, communicating health-related information, and marshalling political support for a health initiative. It is a measure easily understood by the public, and it can affect the public's perception of risk. For example, the following statement about the United States has a powerful simplicity: "cigarette smoking, alone, causes more premature deaths than do all the following together: acquired immunodeficiency syndrome, cocaine, heroin, alcohol, fire, automobile accidents, homicide, and suicide" (Warner 1987, p. 2081). Yet the data that allow such a statement are difficult to assemble, and the methodologies used to determine the number of deaths attributable to smoking are complex (USDHHS 1989).

Although useful, mortality data do not indicate the full effect of a disease or set of diseases on a community. They do not describe the pain, morbidity, disability, economic costs, and decreased quality of life of persons who live with an illness, nor do they describe the secondary effects on family members who lose a close relative.

However, other measures of the effect of a disease have limitations as well. For example, life expectancy, which can express the health status of a population, may be misleading. For developing countries, life expectancy is strongly influenced by infant and childhood mortality and much less so by disease prevention or therapeutic advances that affect adult health. People who have died from a smoking-related disease would have lived approximately 15 years longer if they had not been smokers (Warner 1987). This powerful effect is diluted if the improvement in smokers' life expectancy is averaged over the whole population.

In the following discussion, an attempt is made to specify the number of deaths in Latin America and the Caribbean attributable to smoking, while keeping in mind the limitations of common disease measures. The result is an approximation, an early step in an iterative process for determining the health impact of

tobacco use in the Americas. The methodology, which applies the concept of attributable mortality, is complicated by the need to estimate and adjust data to compensate for missing or insufficient data. A step-by-step description of the methodology is provided in Table 22. The effects of the empirical decisions made are discussed at the end of the chapter (see "A Comment on the Methodology").

Mortality Data

The data in this section are from the PAHO Technical Information System, a data base that includes mortality information. PAHO collects mortality data (by age, sex, and cause of death) from source jurisdictions by using questionnaires, national publications, and other methods. Most of the data are from civil registries, which rely on death certificates completed by health personnel in the field. These mortality data have several problems: the coverage of the population is incomplete, the quality of some data is questionable, and the cause-of-death groupings of the World Health Organization (WHO)/PAHO data collection questionnaire limit comparability with other data.

Coverage

PAHO has estimated that the underregistration of mortality is more than 20 percent in Brazil, Colombia, Dominican Republic, Ecuador, El Salvador, Honduras, Panama, and Peru (PAHO 1990b). The diverse reporting standards from various countries necessitated several country-specific decisions. In Brazil, for example, the most populous country in Latin America and the Caribbean, the estimated underregistration is approximately 25 percent. The level of underreporting differs between areas, although it tends to be worse in the poorer, northern part of the country. The number of reported deaths was used for the whole country, although it is an underestimate. In Paraguay, mortality information is published for only a portion of the country, and the information may not be representative of the remainder of the country. However, the areas not covered by the mortality registry are geographically defined and include about 40 percent of the population. Thus, reasonably reliable disease rates can be determined for a portion of Paraguay but not for the country as a whole. For this country, data from the well-defined reporting areas only were used; for other countries, similar decision rules were used.

Table 22. Method used for calculating smoking-attributable mortality in the Americas

Estimate overall mortality

For each country, evaluate vital registration and use the portion of the data that provides an accurate population-based mortality estimate.

For the 10 jurisdictions without mortality data, use United Nations population schedules and apply mortality rates from countries with similar socio-demographic configurations.

Do not correct for underreporting.

Exclude and do not correct for ill-defined causes.

(Resultant population and mortality estimates are reported in Table 25.)

Estimate cause-specific mortality

Identify the major smoking-associated disease groups (coronary heart disease; cerebrovascular disease; lung cancer; oral, laryngeal, and esophageal cancer; bladder cancer; and chronic obstructive pulmonary disease [COPD]).

Use cause-specific mortality data for countries for which such data are available.

For the 10 jurisdictions without such data, use data from four countries representative of the demographic and socioeconomic spectrum of the Americas (Guatemala, Colombia, Argentina, and the United States).

(Resultant cause-specific mortality estimates are in Table 26.)

Estimate relative risk and attributable risk

Use U.S. estimates for relative risk since country-specific relative risk is generally not available.

Determine the smoking-attributable fraction (SAF) for the United States by using the attributable-risk calculation.

Adjust estimates by using an index related to lung cancer

Use an index of the maturity of the epidemic that relates the lung cancer rate for each country to that of the United States.

For each country, determine an adjusted SAF for each disease by multiplying the index by the U.S. SAF for each disease (Table 32).

For each country, multiply the adjusted SAF for each disease by the number of deaths from the disease to obtain smoking-attributable mortality (SAM) (approximately 375,000).

Adjust the estimate further

Calculate SAM for the United States alone by using this method and compare the result with the official value reported for 1985 (U.S. Department of Health and Human Services 1989).

For each cause, calculate the difference between the result from this method and from the official method.

Apply these upward adjustments to the cause-specific SAMs: increase COPD by 230%, increase cancers by 10.4% (using the difference in lung cancer estimates), and increase other diseases and causes by 16.4% (see footnotes to Table 33).

Calculate the adjusted estimate of SAM in the Americas (526,000).

Data Quality

One measure of the quality of mortality information is the proportion of deaths assigned to the rubric "symptoms, signs, and ill-defined conditions" (*Manual of International Statistical Classification of Diseases, Injuries, and Causes of Death, Ninth Revision [ICD-9]*). Currently, the percentage of mortality ascribed to ill-defined

causes is greater than 10 percent for 16 of the 39 jurisdictions submitting mortality information (PAHO 1990a). In this analysis, ill-defined causes were excluded from calculations of proportions or rates.

Because a decedent may not have received health care or the certifying physician may not have been the physician who treated the decedent, diagnostic

imprecision may occur. More serious distortion may result because the certifying physician did not have the diagnostic tools necessary for accurately determining the cause of death.² Furthermore, managers of health services may not be willing or able to ensure accurate recording or conduct the diagnostic tests that would yield an accurate diagnosis, especially for the elderly. As a result, assessments of mortality levels and trends are often made by considering disease-specific rates for middle-aged rather than elderly populations (Doll and Peto 1981).

Coding

Since 1979, PAHO's participating member states have classified cause of death by using the *ICD-9* coding scheme. To store these data, PAHO developed a grouping of causes of death based on, but not identical to, the Basic Tabulation List of the *ICD-9*. The PAHO grouping is also similar, but not identical, to the groupings used by WHO and CDC. The difference in grouping, which has a variable effect on disease classification, does not affect deaths categorized as due to the following conditions:

Condition	ICD-9 code
Coronary heart disease	410-414
Cerebrovascular disease	430-438
Lung cancer	162
Cancers of the lip, oral cavity, or pharynx	140-149
Cancer of the esophagus	150
Cancer of the larynx	161
Cancer of the bladder	188

However, PAHO grouped cancers of the pancreas (*ICD-9* 157) and kidney (*ICD-9* 189) with other cancers. Chronic obstructive pulmonary disease (COPD), when coded as *ICD-9* 490-492 and 496, cannot be isolated in the PAHO grouping. The relevant PAHO categories are "bronchitis (chronic and unspecified), emphysema, and asthma" (*ICD-9* 490-493). Thus, unlike the grouping for COPD used in the calculation of smoking-attributable mortality (SAM) in the United States (CDC 1991), the PAHO grouping includes *ICD-9* 493 (asthma) and excludes *ICD-9* 496.

Life Expectancy and Mortality

Trends in Life Expectancy and Overall Mortality

For all countries and subregions of the Americas, the overall trend is an increase in life expectancy at birth (Table 23). Over the last 35 years in Latin America and the Caribbean, the average life expectancy at

Table 23. Life expectancy* at birth for persons born during selected periods, by region and country

Region and country	Year of birth			
	1950-55	1970-75	1985-90	2000
Latin America	51.8	61.2	66.6	69.7
Bolivia	40.4	46.7	53.1	60.5
Haiti	37.6	48.5	54.7	59.4
Peru	43.9	55.5	61.4	67.9
Guatemala	42.1	54.0	62.0	68.1
El Salvador	45.3	58.8	62.2	68.8
Nicaragua	42.3	54.7	63.3	69.3
Honduras	42.3	54.0	64.0	68.2
Brazil	51.0	59.8	64.9	68.0
Ecuador	48.4	58.9	65.4	68.2
Dominican Republic	46.0	59.9	65.9	69.7
Paraguay	62.6	65.6	66.9	67.9
Colombia	50.6	61.6	68.2	70.7
Mexico	50.8	62.6	68.9	72.1
Venezuela	55.2	66.2	69.7	71.3
Argentina	62.7	67.3	70.6	72.3
Chile	53.8	63.6	71.5	72.7
Uruguay	66.3	68.8	72.0	73.0
Costa Rica	57.3	68.1	74.7	75.8
Cuba	59.5	71.0	75.2	76.3
Caribbean	56.4	67.1	72.4	74.7
North America	69.1	72.2	76.1	78.1
United States	69.0	71.3	75.4	77.6
Canada	69.1	73.1	76.7	78.5

Source: Centro Latinoamericano de Demografía (1990); Pan American Health Organization (1990a).

*Estimates through 1985 are based on actual data. After 1985, estimates are projections based on trends and on comparisons with data from similar countries.

birth has increased by about 15 years—from 51.8 to 66.6 years. In North America, the increase was seven years—from 69.1 to 76.1 years, reflecting a slower increase as life expectancy at birth reaches age 75 to 80.

Among Latin American and Caribbean countries, the current differences in life expectancy at birth are great—ranging from 53.1 and 54.7 years in Bolivia and Haiti, respectively, to 75.2 years in Cuba. Over the last 35 years, the range has diminished somewhat.

² Historically, the lack of appropriate diagnostic tools had a major impact on the number of deaths assigned to lung cancer. When diagnostic radiology was introduced in England in the 1920s, the rate of certified lung cancer deaths increased threefold (Peto 1986).

During 1950 to 1955, the range was 28.7 years; today it is 22.1 years, and by the year 2000, it is expected to decrease to 16.9 years. Few Latin American and Caribbean countries are at the low end of the range. Currently, only about 3 percent of the population of Latin America and the Caribbean lives in countries with a life expectancy at birth lower than 55 years, while 86 percent lives in countries with a life expectancy at birth of 65 years or more. All countries except Bolivia and Haiti are expected to achieve a life expectancy at birth of 65 years or more by the year 2000 (PAHO 1990a).

Differences in the rate of increase are also evident among countries. For example, although life expectancy at birth in Chile and Uruguay is now similar, it increased three times more in Chile than in Uruguay over the last 35 years. In general, the increase in life expectancy at birth was slower in the 1970s and 1980s than in the 1950s.

The current life expectancy at birth in Latin America and the Caribbean is equivalent to that in the United States around 1945 to 1950—before many major advances in chronic disease prevention and treatment occurred (PAHO 1990a). Based on the current rate of improvement, the life expectancy at birth in Latin America and the Caribbean should reach that currently found in the United States by about the first quarter of the next century (Centro Latinoamericano de Demografía 1990).

The range of population and mortality parameters is illustrated by data for four countries (Guatemala, Colombia, Argentina, and the United States) that represent the broad spectrum of variation within the Americas (Table 24). This variation highlights the

diverse potential effects of smoking on a population. For example, for all deaths in women (excluding deaths from ill-defined causes), the fraction of deaths in women aged 35 or older ranges from 34 percent in Guatemala to 95 percent in the United States. Since most SAM occurs among persons 35 years old or older, it is this group whose health is most affected by a tobacco habit.

Estimates of Mortality

The PAHO Technical Information System contains national mortality data suitable for this analysis for all but 10 jurisdictions in the Americas: Antigua and Barbuda, Bermuda, Bolivia, Guadalupe, Grenada, Haiti, Montserrat, Netherlands Antilles, Nicaragua, and Saint Pierre and Miquelon.

To determine the number of deaths in the Americas attributable to smoking, the number of deaths for these 10 jurisdictions had to be estimated. The United Nations (1989) population estimates for these jurisdictions were used for this calculation. Crude population mortality rates and other major mortality parameters were applied by using data for countries in the PAHO Technical Information System believed to be similar with respect to life expectancy, geographic region, per capita gross national product, tobacco consumption rates, and other factors. These estimates were used along with others obtained by standard means (Table 25).

These nonstandard estimates are sensitive to the choice of country used to model the mortality structure. In general, these are underestimates of actual mortality because of underreporting and because

Table 24. Mortality from defined causes,* selected countries, c. 1985

Country	Sex	Population [†]	Total Mortality [†]	Persons aged ≥35 years	
				Mortality [†]	Percentage of total mortality
Guatemala	M	3,914	32	11	34
	F	3,826	27	9	34
Colombia	M	14,103	74	45	61
	F	14,007	55	39	70
Argentina	M	15,049	129	110	85
	F	15,283	103	89	86
United States	M	116,160	1,080	987	91
	F	122,571	975	930	95

Source: Pan American Health Organization (1990b).

*Excludes ill-defined causes; see text.

[†]Number, in thousands.

Table 25. Mortality from defined causes,* regions of the Americas, c. 1985

Region	Sex	Population [†]	Total Mortality [†]	Persons aged ≥35 years	
				Mortality [†]	Percentage of total mortality
Latin America	M	197,023	1,168	736	63
	F	196,887	892	592	66
Andean Area	M	40,177	207	109	53
	F	39,705	166	95	57
Southern Cone [‡]	M	24,377	190	159	84
	F	24,785	153	131	86
Brazil	M	67,601	367	239	65
	F	67,963	254	177	70
Central America [§]	M	12,190	78	32	41
	F	12,002	62	26	42
Mexico	M	39,744	224	134	60
	F	39,631	171	112	66
Latin Caribbean	M	12,934	101	63	62
	F	12,801	87	52	60
Caribbean	M	3,510	21	17	78
	F	3,571	18	15	82
North America	M	128,768	1,179	1,078	92
	F	135,410	1,055	1,006	95
All regions of the Americas	M	329,301	2,368	1,831	77
	F	335,868	1,965	1,614	82
Total		665,169	4,333	3,444	80

Source: Pan American Health Organization (1990b).

*Excludes ill-defined causes; see text.

[†]Number, in thousands.

[‡]Includes Falkland Islands.

[§]Excludes Belize.

^{||}Includes Bermuda and St. Pierre and Miquelon.

mortality from ill-defined causes has been excluded (as discussed earlier). The resultant estimates of smoking-related mortality are conservative.

Total, Cause-Specific, and Age-Specific Mortality

The composite of reported and estimated mortality indicates that approximately 4,300,000 deaths occur in the Americas each year; about half of these deaths (2,060,000) occur in Latin America (Table 25). In the Americas overall, about 80 percent of deaths occur among persons aged 35 or older; in Latin America, the fraction is about 64 percent. The fraction of deaths occurring among persons aged 35 or older varies from a low of about 41 percent in Central America

to a high of 92 to 95 percent in North America. Most of the population of Latin America lives in countries where this fraction is between 60 and 70 percent.

The greatest absolute increase in life expectancy at birth is generally associated with improvements in mortality rates for children. In Latin America, a gradient of economic development is associated with increased life expectancy. In general, the death rate for children is lower in more highly developed countries, but the death rate for older persons is similar in various economic settings. For example, in Argentina, the mortality rate per 1,000 persons under five years of age is 7.9, and for persons aged 65 or older, it is 65.8. In Guatemala, the rate for persons under five years of

age is 21.4, but for persons aged 65 or older, it is 67.5 (PAHO 1990a).

The gradient of economic development is also reflected in the cause-of-death mortality structure. Among men aged 45 to 64, mortality from heart disease, expressed as a percentage of total mortality, is 11 percent in Guatemala, 27 percent in Colombia, and 37 percent in the United States. But some similarities are emerging. For both the 45 to 64 and the 65 or older age groups, the three leading causes of death for each sex are the same in both Colombia and the United States. For the oldest age group, the leading cause of death—diseases of the heart—is also the same in Guatemala (PAHO 1990a).

This pattern—increasing similarity of causes of death—is likely to intensify. As life expectancy improves, the epidemiologic profile of a country changes. Countries with a lower life expectancy tend to have a younger population, and the greatest mortality is in the younger age groups. In these countries, deaths are primarily due to infections (such as acute respiratory infections and diarrhea), malnutrition, and conditions originating in the perinatal period. As these diseases are controlled and life expectancy increases, deaths from chronic diseases—in particular,

cardiovascular diseases and cancer—become the dominant health problem (PAHO 1990a).

Mortality from Smoking-Related Diseases

Estimates of Cause-Specific Mortality

The major diseases associated with tobacco smoking include coronary heart disease, cerebrovascular disease, COPD, and cancers of the lung, lip, oral cavity, pharynx, larynx, esophagus, pancreas, bladder, and kidney. In the United States, each of these causes (considering cancers of the lip, oral cavity, and pharynx as a single group) contributes at least 2,000 deaths to the total number of deaths attributable to smoking (USDHHS 1989).

The four countries for which population data were assessed (Table 24) and the six smoking-related conditions (Table 26) were the focus of this analysis of the effect of smoking on countries of the Americas. Cancers of the lip, oral cavity, pharynx, larynx, and esophagus were grouped because of the similar smoking-attributable risk for these conditions (USDHHS 1989). Cancers of the kidney and pancreas were excluded because they cannot be specifically identified in the PAHO Technical Information System. The four countries

Table 26. Deaths from six major causes as a percentage of all deaths from defined causes,* for persons aged 35 or older, selected countries, c. 1985

Country and sex†	Coronary heart disease (aged 35–64)	Coronary heart disease (aged ≥65)	Cerebrovascular disease (aged 35–64)	Cerebrovascular disease (aged ≥65)	Lung cancer	Oral,† laryngeal, and esophageal cancer	Bladder cancer	Chronic obstructive pulmonary disease§	All categories
Guatemala									
Men	2.2	3.6	1.2	2.5	0.1	0.3	0.1	1.2	11.2
Women	1.6	3.2	1.8	3.8	0.4	0.1	0.0	1.1	12.0
Colombia									
Men	6.3	10.1	3.4	6.8	2.1	1.6	0.3	1.9	32.5
Women	4.7	10.2	4.7	9.5	1.3	1.0	0.2	1.8	33.4
Argentina									
Men	4.8	8.1	3.6	7.0	5.6	2.5	0.9	1.2	33.7
Women	1.6	8.6	2.7	9.9	1.1	0.8	0.2	0.9	25.8
United States									
Men	7.6	21.3	1.0	5.0	8.5	1.5	0.7	1.3	46.9
Women	2.8	24.1	1.0	8.9	4.2	0.6	0.3	0.9	42.8

Source: Pan American Health Organization (1990b).

*Codes from *Manual of International Statistical Classification of Diseases, Injuries, and Causes of Death*, Ninth Revision: coronary heart disease, 410–414; cerebrovascular disease, 430–438; lung cancer, 162; cancers of lip, oral cavity, and pharynx, 140–149; cancer of the esophagus, 150; cancer of the larynx, 161; cancer of the bladder, 188.

†Cancer of the lip, oral cavity, and pharynx.

‡The denominator for each row is the total number of deaths from defined causes, by country and sex.

§See text for a description of this rubric.

chosen represented four different points on the spectrum of mortality rates. Guatemala was chosen, even though its lung cancer rate is low, because it reports nationwide mortality statistics and has one of the lowest levels of life expectancy in Latin America.

For persons aged 35 or older, the distribution of deaths from the six major causes was expressed as a percentage of all deaths from defined causes (Table 26). Because SAM from coronary heart disease and cerebrovascular disease differs significantly between persons aged 35 to 64 and persons aged 65 or over (USDHHS 1989), estimates for both these age groups are presented.

For all six smoking-related illnesses and age subcategories taken together (Table 26, last column), the proportion of deaths caused in persons aged 35 or older differed among the countries. In Guatemala, these diseases accounted for slightly over 10 percent of adult deaths. In Argentina and Colombia, they accounted for 25 to 33 percent of deaths, while in the United States, they contributed approximately 45 percent of deaths.

To estimate the number of deaths from smoking-related conditions for subregions of the Americas (Table 27), both the reported mortality data (Table 25) and synthetic mortality estimates for the 10 jurisdictions without data were used. For these jurisdictions, the mortality distribution patterns from the four selected countries (Table 24) were applied, as described.

Substantially more deaths in North America than in Latin America and the Caribbean were attributed to coronary heart disease, lung cancer, and bladder cancer. The number of deaths was similar in North America and in Latin America and the Caribbean for cerebrovascular disease, COPD, and oral cancer. Using these estimates, 81 percent of lung cancer deaths in the Americas occur in North America. When accounting for underreporting, the proportion is probably closer to 75 percent. (Using a different approach, other researchers have estimated that North America accounts for 77 percent of lung cancer deaths [Parkin, Laara, Muir 1988]). Because lung cancer is a strong indicator of all smoking-attributable diseases, a rough approximation suggests that the number of deaths in Latin America and the Caribbean attributable to smoking will be about one-third to one-fourth of the number in North America.

Estimates of Relative Risk Due to Smoking

Relative risk is defined as $r = d(1)/d(0)$, where $d(1)$ and $d(0)$ are the incidence of a particular disease for exposed and unexposed cohorts, respectively. For current smokers, the relative risk for a disease estimates

the increase in disease incidence associated with a history of smoking. This risk varies widely among population groups due to differences in smoking-related factors, such as person-years of smoking contributed by heavy smokers, age at initiation, and cigarette product smoked. For example, among current smokers in a population, the relative risk for lung cancer would be expected to be relatively low if a sizable proportion of the population recently began to smoke heavily. If, however, heavy smoking has been common since World War II, the risk would be relatively high. The main reason for this effect is that the exposure category defined by "current smokers" is based on current rather than past smoking habit, but lung cancer rates primarily depend on smoking patterns of 20 or more years ago.

For many of the smoking-related causes of death, few country-specific estimates of relative risk are available for Latin American and Caribbean populations, and most have focused on cancer. For current cigarette smokers in the United States, aged 35 or older, the estimated relative risk for lung cancer is 22.4 for men and 11.9 for women (USDHHS 1989). In Cuba, the relative risk is 14.1 for men and 7.3 for women. Dark tobacco is the variety of tobacco most commonly smoked in Cuba and many other areas of Latin America. In Cuba, dark tobacco is associated with a higher relative risk for lung cancer than light tobacco is: for men, 14.3 and 11.3, respectively, and for women, 8.6 and 4.6, respectively (Joly, Lubin, Caraballoso 1983). In Colombia, the relative risk for lung cancer among current smokers was 10.3 in one case-control study of 102 persons with lung cancer, 74 percent of whom were men (Restrepo et al. 1989).

The study in Colombia also reported relative risk for cancer of the bladder, larynx, and oral cavity/hypopharynx of 3.7, 37.9, and 11.2, respectively. In La Plata, Argentina, where the rate of bladder cancer is high, a relative risk of 7.2 for bladder cancer was found for men who were current smokers (Iscovich et al. 1987). In a study of 232 cases of cancer in Brazil (87 percent of patients were men), the relative risk for cancer of the tongue, gum, floor of the mouth, and other parts of the oral cavity was 9.3 for current smokers of manufactured cigarettes (Franco et al. 1989). In a 1966 case-control study of male cigarette smokers and nonsmokers in Puerto Rico, the relative risk was 1.5 for esophageal cancer, 1.1 for cancer of the oral cavity, and 2.7 for cancer of the pharynx (Martínez 1969). In Montevideo, Uruguay, the relative risk for laryngeal cancer was 35.4 for male smokers of dark tobacco and 14.7 for male smokers of light tobacco (De Stefani et al. 1987). For comparison, for U.S. men who

Table 27. Deaths (in thousands) from six major causes,* for persons aged 35 or older, selected regions of the Americas, c. 1985

Region and sex	Coronary heart disease (aged 35–64)	Coronary heart disease (aged ≥65)	Cerebro-vascular disease (aged 35–64)	Cerebro-vascular disease (aged ≥65)	Lung cancer	Oral, [†] laryngeal, and esophageal cancer	Bladder cancer	Chronic obstructive pulmonary disease [‡]
Latin America								
Men	38.1	59.7	28.5	49.8	22.4	14.1	3.0	15.6
Women	16.7	53.2	22.6	55.5	6.8	4.0	1.0	11.3
Andean Area								
Men	5.5	8.7	3.2	6.1	2.1	1.3	0.3	2.0
Women	3.1	7.6	3.3	7.2	1.0	0.6	0.1	1.8
Southern Cone [§]								
Men	7.3	13.8	5.5	11.9	8.2	3.9	1.2	2.9
Women	2.2	12.6	3.7	14.4	1.4	1.1	0.3	1.7
Brazil								
Men	16.6	19.3	15.7	21.0	6.1	6.2	0.9	4.8
Women	7.2	17.5	11.5	21.7	1.9	1.4	0.3	2.7
Central America								
Men	1.0	2.0	0.5	1.3	0.3	0.2	0.05	0.6
Women	0.5	1.6	0.6	1.5	0.2	0.01	0.02	0.5
Mexico								
Men	4.2	7.1	2.3	5.6	2.8	1.1	0.3	4.5
Women	1.9	6.3	2.2	6.8	1.3	0.4	0.1	3.8
Latin Caribbean								
Men	3.5	8.9	1.4	3.9	2.5	1.4	0.3	0.9
Women	1.8	7.5	1.3	3.9	0.9	0.4	0.1	0.7
Caribbean								
Men	0.8	1.2	0.7	1.9	0.4	0.3	0.1	0.3
Women	0.4	1.1	0.6	2.2	0.1	0.1	0.03	0.2
North America [¶]								
Men	82.2	230.3	11.2	54.7	92.0	16.4	7.5	14.2
Women	27.8	242.2	9.6	89.8	41.7	6.1	3.4	9.2
All regions of the Americas								
Men	121.0	291.2	40.4	106.3	114.4	30.8	10.6	30.1
Women	44.9	296.5	32.8	147.5	48.5	10.1	4.4	20.6
Total	165.9	587.7	73.2	253.8	162.9	40.9	15.0	50.7

Source: Pan American Health Organization (1990b).

*Codes from *Manual of International Statistical Classification of Diseases, Injuries, and Causes of Death*, Ninth Revision: coronary heart disease, 410–414; cerebrovascular disease, 430–438; lung cancer, 162; cancers of lip, oral cavity, and pharynx, 140–149; cancer of the esophagus, 150; cancer of the larynx, 161; cancer of the bladder, 188.

[†]Cancer of the lip, oral cavity, and pharynx.

[‡]See text for a description of this rubric.

[§]Includes Falkland Islands.

^{||}Excludes Belize.

[¶]Includes Bermuda and St. Pierre and Miquelon.

are current smokers, the relative risk for cancer of the bladder is 2.9, cancer of the esophagus 7.6, cancer of the larynx 10.5, and cancer of the lip, oral cavity, and pharynx 27.5 (USDHHS 1989).

Two case-control studies were conducted to investigate the factors associated with esophageal cancer in Uruguay, which has one of the highest rates of esophageal cancer in the world. In one study of 226 cases, the relative risk was 6.5 for ever smokers (82 percent were men) (Vassallo et al. 1985). In the other study of 199 cases, the relative risk was 5.7 for current male smokers (De Stefani et al. 1990). In bordering southern Brazil, which also has a high rate of esophageal cancer, the relative risk was 8.4 for male smokers (Victora et al. 1987).

For countries for which relative risk estimates were lacking, relative risks were derived from U.S. data and used in the following computations of SAM (USDHHS 1989, 1990). Small differences in relative risk estimates are unlikely to have a large overall effect on SAM because of the structure of the formula for calculating attributable risk (see below).

Smoking-Attributable Mortality

Estimates of Smoking-Attributable Mortality Worldwide

Interest in attempting to quantify the extent of the health hazard caused by tobacco led to development of smoking-attributable fractions (SAFs). These values estimate the proportion of cases of a specific disease in a population that can be attributed to smoking.

$$SAF = \frac{p(r-1)}{1 + p(r-1)}$$

in which p is the proportion of the population that has ever smoked and r is the risk for ever smokers relative to never smokers. The SAF calculated for each disease of interest is multiplied by the number of deaths for that disease, and the result is the SAM for that disease. The sum of SAM values for all diseases associated with tobacco use gives the total number of deaths attributable to smoking.

The SAF can be refined to account for differences in smoking status (never, current, or former smoker) and for age and sex subgroups. Smoking prevalence and relative risk can be estimated for each of these subgroups. SAFs have been calculated for 10 selected causes of death in the United States (Table 28).

Recent studies have estimated the number of deaths attributable to smoking in the United States (Table 29). The estimates by Rice and colleagues,

Table 28. Smoking-attributable fraction for 10 selected causes of death, United States, 1985

Cause of death	Men (%)	Women (%)
Coronary heart disease (aged 35–64)	45	41
Coronary heart disease (aged ≥65)	21	12
Cerebrovascular disease (aged 35–64)	51	55
Cerebrovascular disease (aged ≥65)	24	6
Cancer of the lung	90	79
Cancer of the lip, oral cavity, and pharynx	92	61
Cancer of the larynx	81	87
Cancer of the esophagus	78	75
Cancer of the pancreas	29	34
Cancer of the bladder	47	37
Cancer of the kidney	48	12
Chronic obstructive pulmonary disease	84	79

Source: U.S. Department of Health and Human Services (1989).

CDC, and USDHHS all considered smoking status, age, and sex. The estimates vary for several reasons: the diseases included, the specific methodology used, the target year, and the source of the smoking prevalence data and the relative risk estimates. The most recent (1988) estimate for the United States (434,000 smoking-attributable deaths) is discussed in Chapter 4, "Economic Costs of the Health Effects of Smoking." The 1985 estimate is used here to maintain consistency with data available for Latin America and the Caribbean.

SAM has been estimated for many European countries (Table 30), and the current worldwide estimate is 3 million smoking-attributable deaths per year.

The methodology described earlier for calculating SAM can be used for countries for which reliable information is available on smoking prevalence and on the risk for major tobacco-associated diseases among ever smokers relative to never smokers. Unfortunately, few countries in Latin America have such data; an alternative methodology for calculating SAM is described below.

Lung Cancer Mortality as an Index of Prior Smoking in a Population

Numerous attempts have been made to describe the relationship between smoking habits and mortality

Table 29. Smoking-attributable mortality in the United States

Reference	Year	Estimate
Rice et al., 1986	1980	270,000
U.S. Office of Technology Assessment, 1985	1982	314,000
Centers for Disease Control, 1987b	1985	320,000
U.S. Department of Health and Human Services, 1989	1985*	390,000

*The 1985 estimate (rather than the 1988 estimate of 434,000 reported in Chapter 4, Table 1) is used here to maintain consistency with the demographic and vital data available for Latin America and the Caribbean.

from lung cancer in a population. Many of these attempts have not been entirely successful, primarily due to the lack of key information. Current lung cancer mortality rates reflect smoking habits of 20 to 40 years ago. Reliable data on lung cancer incidence and mortality are available for many industrialized countries, but only limited information is available on previous smoking habits. Furthermore, the relationship between smoking and lung cancer is affected by many factors. Duration of smoking is the factor most strongly correlated with risk for lung cancer. For example, when duration of regular tobacco use is doubled from 15 to 30 years, lung cancer incidence increases about 20-fold (Peto 1986). Other factors that affect lung cancer risk include number of cigarettes smoked per day, age at initiation, tar yield of tobacco products, use of filters, blend of tobaccos, and depth of inhalation. Many of these factors vary over time, not only for a national population but for individuals within a population. Only in recent years have surveys in a few industrialized countries collected data on these factors in some detail. Thus, data are unavailable for building an optimal model of smoking habits and lung cancer risk.

Nevertheless, tobacco consumption is highly correlated with lung cancer; the SAF has been calculated at over 90 percent for countries that have populations with a long history of high prevalence of heavy smokers (Table 31). This strong association suggests that lung cancer mortality can be used as a surrogate to measure the impact of smoking on a population.

The following index (*I*) uses lung cancer mortality rates for the population aged 55–64. This index, a measure of smoking maturity in a population, contains population risk factor information related to the

smoking habits of the population, as expressed by the risk of dying from lung cancer.

$$I = \sqrt{\frac{R(C) - R(US,N-S)}{R(US) - R(US,N-S)}}$$

for $R(US,N-S) < R(C) < R(US)$

in which $R(C)$ is the lung cancer mortality rate for a country in the Americas, $R(US)$ is the lung cancer rate for the United States (Table 31), and $R(US,N-S)$ is the lung cancer rate for never smokers in the United States (12.7 for men and 11.1 for women). When $R(C)$ is greater than $R(US)$, the index is arbitrarily set to 1.

The index has the following properties:

- It equals 0 for the few countries in Latin America and the Caribbean with a lung cancer rate below that of never smokers in the United States.
- It equals 1 for countries that have a lung cancer rate higher than that of the United States (although there were none).
- It falls between 0 and 1 for countries with a lung cancer rate between the U.S. rate for never smokers and the overall U.S. rate, and the value increases as the country's rate approaches that of the United States.

This index can be used to develop estimates of SAM for countries in Latin America and the Caribbean. For a given country, the lung cancer rate and index are calculated, and this lung cancer index is used to adjust all diseases. The index is multiplied by the disease-specific SAF for the United States to obtain an adjusted disease-specific SAF for a specific country. The number of deaths from a specific cause is then multiplied by the adjusted SAF to obtain the SAM.

Thus, the index adjusts the SAF downward—to a level appropriate for the extent of lung cancer in the population. The index is nonlinear; large changes in the upper range of lung cancer rates have only a small effect on the SAF. But changes in the lower range, closer to the rate for never smokers, have a proportionately larger effect on the SAF. In Table 31, the SAF is given with and without the index adjustment. The index uniformly offers a more conservative estimate of SAF.

Because of the potential for diagnosis of lung cancer to be more inadequate in some elderly populations than in younger populations, and because of the need to choose a relatively stable measure of smoking habits, the lung cancer rate for persons aged 55 to 64 was used in creating the index. If older age groups are used, significant diagnostic misclassification occurs, and the relationship to smoking is more tenuous. The low rates for younger age groups render the rate estimates

Table 30. Estimated number of deaths due to tobacco use in 27 countries of the World Health Organization (WHO) European Region*

Country	Year	Male	Female	Total
Austria	1985	5,527	3,354	8,881
Belgium	1984	8,905	2,664	11,569
Bulgaria	1984	6,129	3,215	9,344
Czechoslovakia	1984	14,693	7,363	22,056
Denmark	1985	5,531	3,311	8,842
Finland	1984	4,094	1,900	5,994
France	1984	25,751	10,102	35,853
German Democratic Republic	1984	12,393	6,178	18,571
Germany, Federal Republic of	1985	49,572	26,433	76,005
Greece	1984	5,305	1,718	7,023
Hungary	1985	10,742	5,541	16,283
Iceland	1984	115	78	193
Ireland	1983	2,754	1,449	4,203
Israel	1984	1,416	859	2,275
Italy	1981	39,489	15,324	54,813
Luxembourg	1985	298	121	419
Malta	1985	115	54	169
Netherlands	1985	12,140	3,892	16,032
Norway	1984	3,046	1,553	4,599
Poland	1985	23,858	7,337	31,195
Portugal	1985	3,656	1,778	5,434
Romania	1984	12,178	7,907	20,085
Spain	1980	14,492	5,738	20,230
Sweden	1985	7,104	4,339	11,443
Switzerland	1985	4,299	1,610	5,909
United Kingdom	1984	60,764	33,916	94,680
Yugoslavia	1982	9,103	3,732	12,835
Total for region		343,469	161,466	504,935
Total worldwide	1991			3,000,000

Source: WHO (1988, 1991 [for worldwide estimate]).

*Represents about 60% of the regional population. Tobacco is held responsible for about 90% of all deaths from lung cancer, 75% of bronchitis/emphysema deaths, and 25% of all deaths from ischemic heart disease. The estimate for each country is based on the most current data provided to WHO by the countries themselves.

unstable. Further, the use of a single, well-defined group at risk has the virtue of simplicity—data directly available to a country are used, and adjustment that might be necessary for cross-country comparisons is avoided.

Estimates of Smoking-Attributable Mortality in the Americas

Unadjusted Estimates

Before adjustment, approximately 375,000 deaths in the Americas were attributable to smoking around 1985 (Table 32). These were distributed by disease as follows:

Disease	Total SAM
Coronary heart disease	144,200
Cerebrovascular disease	46,800
Lung cancer	128,600
Oral, laryngeal, and esophageal cancer	23,200
Bladder cancer	5,700
COPD	27,300

In Latin America and the Caribbean, an intermediate estimate of 64,000 smoking-attributable deaths was obtained, and most of these deaths were from coronary heart disease (about 18,500), cerebrovascular disease (about 17,000), and lung cancer (about 13,000). The largest contribution to SAM in Latin America was made by Brazil, followed closely by the Southern Cone subregion.

Table 31. Smoking-attributable fraction (SAF) and adjusted SAF for lung cancer mortality, selected industrialized countries, 1978–1981

Country	Sex	Crude lung cancer rate*	SAF	Index of smoking maturity	Adjusted SAF†	Difference between SAF and adjusted SAF
Canada	M	142.8	.90	.92	.85	.05
	F	34.0	.71	.77	.60	.11
England and Wales	M	228.5	.94	1.00	.92	.02
	F	63.3	.80	1.00	.78	.02
Japan	M	64.8	.83	.58	.53	.30
	F	21.0	.58	.50	.39	.19
Sweden	M	85.0	.83	.69	.63	.20
	F	28.0	.57	.66	.51	.06
United States‡	M	166.7	.92	1.00	.92	.00
	F	50.0	.78	1.00	.78	.00

Source: Adapted from International Agency for Research on Cancer (1986).

*For persons aged 35 or older. The calculation actually uses the rate for persons aged 55–64 years.

†Calculated by multiplying the SAF for the United States by the country-specific index of smoking maturity; see text.

‡Total population.

SAM was calculated as the percentage of deaths for persons aged 35 or older (last column of Table 32). For the Latin American subregions, the proportion was highest for men in the Southern Cone and lowest for men in Central America. In the Southern Cone, the difference in the rate for men and women reflects a large historical difference in the rate of tobacco consumption (see “Prevalence of Smoking” earlier in this chapter). The lung cancer mortality rate for women in Peru was less than that for U.S. women who were never smokers. The index was zero, and by this method, no deaths were attributable to smoking.

Adjusted Estimates

The estimates of SAM (Table 32) are underestimates for several reasons: (1) COPD was undercounted due to differences in cause-of-death groupings; (2) cancers of the kidney and pancreas were omitted; (3) the SAF for cancers of the oral cavity, esophagus, and larynx is an underestimate (the three cancers were grouped, and the smallest SAF for the three was used); (4) other categories of disease or death were omitted, including other types of cardiovascular and respiratory disease, cervical cancer, infant deaths due to maternal smoking during pregnancy and post-natal exposure to environmental tobacco smoke, lung cancer deaths due to passive smoking, and deaths from smoking-related fires; and (5) an undercount of deaths due to both underregistration of cases and the

exclusion of deaths attributed to ill-defined causes. SAM was adjusted for the first four of these factors as follows. For the United States, the estimate of SAM was calculated and compared with that made for 1985 (USDHHS 1989). The latter estimate, which provided a benchmark, was 37.2 percent larger than the estimate computed in this analysis. The percent difference between these two estimates was used to alter upward the estimates for the other countries in the Americas. The adjustments were made by cause (Table 33, see footnotes), since the degree of underestimate varied with the condition.

After adjustment, an estimated 526,000 annual deaths in the Americas are attributable to tobacco use; about 100,000 of these are in Latin America and the Caribbean. About two-thirds of these deaths occur in Brazil and the Southern Cone. The estimated 36,000 deaths for Bermuda, Canada, and St. Pierre and Miquelon correspond closely with estimates derived by using several different methods and previously reported for Canada alone (Collishaw, Tostowaryk, Wigle 1988; PAHO 1992). As discussed below, the 100,000 annual deaths in Latin America and the Caribbean, estimated from data for the mid-1980s, is conservative. If the current U.S. SAF is applied and if Latin American and Caribbean countries follow a trajectory similar to that of North America, over 1 million smoking-attributable deaths per year will occur in Latin America and the Caribbean by the year 2030.

A Comment on the Methodology

The attribution of mortality requires an empirical approach. In the method used here, which varies somewhat in detail, but not in fundamental approach, from other methods (WHO 1989), at least five basic empirical decisions were made. First, the analysis excluded mortality data for which cause of death was inadequately specified, and no attempt was made to adjust for the underreporting of deaths. Second, synthetic estimates of mortality structure were used for countries with little or no data. Third, a proration was used to adjust for causes of death that could not be analyzed by using PAHO data. Fourth, an empirical index was developed to adjust for the many factors that influence the risk that smoking imposes on a population. Fifth, the SAM calculation made for the United States (USDHHS 1989) was used as a benchmark for adjusting the estimates derived in this analysis. Each of these decisions influenced the final estimate; in addition, some specific features of the index and factors related to attributable risk in general also had an influence.

The net effect of the empirical decisions is difficult to assess, but the first decision—no correction for underreporting and no proration for ill-defined causes—probably dominates and results in a sizable underestimate. The order of magnitude of the underestimate can be approximated by comparing the estimate of total mortality in Latin America derived for this analysis (2,060,000 [Table 25]) with an estimate, derived by using regression methods, that attempted to account for underreporting (3,197,000 [Hakulinen et al. 1986]). Based on this difference in overall mortality of about 55 percent, the number of smoking-attributable deaths might be as high as 155,000. The more conservative estimate of 100,000 smoking-attributable deaths was deemed more appropriate because it directly relates to the data with which ministries of health in Latin American and Caribbean countries actually work. In addition, the conservative method allows a simple, uniform decision rule to be used by all countries of the region in making their own computations. Finally, this approach allows for increasingly credible estimates of SAM to be made as better mortality data become available and the estimates are gradually refined.

The index of smoking maturation is based on a comparison of lung cancer rates. Although accurate information is more readily available for lung cancer than for other conditions, it may not be the optimal condition for use in calculating the index. Although tar levels affect the risk for lung cancer, they apparently do not affect the risk for cardiovascular disease

and COPD (USDHHS 1981). Further, the lag between increased consumption of tobacco and a rise in lung cancer mortality may not be representative of the lag for other diseases. In addition, use of the 55 to 64 age group for calculating the index underestimates the population's exposure to smoking in most Latin American and Caribbean countries because peak tobacco-consumption rates have not yet been reached.

Because the index is empirical, there is no clear methodologic justification for the square root transformation. Many transformations are available; the square root was used because of properties appropriate to the analysis. Specifically, taking the square root of numbers less than one produces a nonlinear effect: it increases all numbers that are less than one, but it has a greater effect on numbers close to zero than on numbers close to one. Thus, upward revision is proportionately greater for countries with low rates than for countries with high rates. This choice modulates, to some extent, the conservative nature of the index. On the other hand, no deaths were attributed to smoking in countries with lung cancer rates less than those for U.S. never smokers. Since smoking is not uniformly distributed in such countries, rates may be higher for some subgroups, and at least some deaths should have been attributed to smoking.

Finally, this methodology is weakened by a lack of information on multiple risk factors. The SAF may be higher or lower when risks other than smoking play a significant role in disease causation. Because smoking is the dominant risk factor for lung cancer, this effect is probably negligible. In cardiovascular disease, however, smoking interacts with hypertension, hypercholesterolemia, physical inactivity, obesity, diabetes, and possibly other risk factors as well, and this effect may be considerable.

Thus, the empirical choices and the specifics of the analysis may have differing effects, but the final estimate of 526,000 annual deaths attributable to smoking in the Americas is almost certainly conservative. This estimate—perhaps best viewed as the first point on a continuum of such estimates—provides an order of magnitude for the number of smoking-related deaths in the Americas.

If, as suggested in the first half of this chapter, the prevalence of cigarette smoking is increasing in some areas, accurate assessment of SAM is of considerable importance. As noted, the lack of some critical data diminishes the precision of the estimates and fosters a greater reliance on empirical decisions. As data systems develop, individual countries will be better able to apply these methods for calculating SAM for their own populations.

Table 32. Smoking-attributable mortality* for men and women in the Americas, c. 1985

Region and country	Lung cancer mortality rate [†]	Index of smoking maturity	Coronary heart disease (aged <65)		Coronary heart disease (aged ≥65)		Cerebro-vascular disease (aged <65)	
			SAF [§]	SAM	SAF	SAM	SAF	SAM
Men								
Latin America	—	—	—	8,426	—	6,432	—	7,090
Andean Area	—	—	—	785	—	557	—	462
Colombia	34.1	.302	.136	386	.063	287	.154	237
Peru	19.5	.140	.063	24	.029	25	.072	24
Venezuela	55.6	.444	.200	354	.093	228	.226	167
Southern Cone [¶]	—	—	—	2,583	—	2,245	—	2,151
Argentina	155.5	.829	.373	1,983	.174	1,156	.423	1,659
Chile	80.6	.566	.255	290	.119	344	.288	261
Brazil	57.8	.456	.205	3,411	.096	1,844	.233	3,652
Central America**	—	—	—	71	—	89	—	36
Mexico	44.3	.376	.169	708	.079	559	.192	435
Latin Caribbean	—	—	—	867	—	1,138	—	355
Cuba	119.8	.716	.322	711	.150	974	.365	298
Caribbean	—	—	—	128	—	108	—	129
North America ^{††}	—	—	—	36,907	—	48,251	—	5,696
Canada	209.0	.975	.439	3,376	.205	4,044	.497	449
United States	219.0	1.000	.450	33,526	.210	44,204	.510	5,243
All regions of the Americas	—	—	—	45,460	—	54,791	—	12,914
Women								
Latin America	—	—	—	1,848	—	1,837	—	857
Andean Area	—	—	—	346	—	234	—	101
Colombia	16.1	.267	.110	198	.032	126	.147	59
Peru	7.8	—	—	—	—	—	—	—
Venezuela	23.7	.409	.167	149	.049	108	.225	42
Southern Cone [¶]	—	—	—	236	—	403	—	223
Argentina	16.6	.279	.114	162	.033	259	.153	149
Chile	19.5	.338	.139	63	.041	119	.186	58
Brazil	15.0	.240	.098	706	.029	505	.132	313
Central America**	—	—	—	20	—	28	—	10
Mexico	16.4	.274	.112	209	.033	207	.151	113
Latin Caribbean	—	—	—	331	—	459	—	98
Cuba	42.2	.632	.259	299	.076	405	.347	85
Caribbean	—	—	—	30	—	27	—	29
North America ^{††}	—	—	—	11,315	—	28,854	—	5,343
Canada	75.1	.901	.369	768	.108	1,919	.496	386
United States	90.1	1.000	.410	10,547	.120	26,934	.550	4,957
All regions of the Americas	—	—	—	13,194	—	30,718	—	6,229

Source: Pan American Health Organization (1990b).

*Mortality from defined causes for persons aged 35 or older, in thousands.

[†]Cancer of the lip, oral cavity, and pharynx.

[‡]The lung cancer rate for U.S. never smokers used for the index calculation was 15.5 per 100,000 men aged 55–64 and 10.4 per 100,000 women aged 55–64.

Cerebro-vascular disease (aged ≥65)		Lung cancer		Oral, [†] laryngeal, and esophageal cancer		Bladder cancer		Chronic obstructive pulmonary disease		Total SAM	Total SAM as proportion of total mortality
SAF	SAM	SAF	SAM	SAF	SAM	SAF	SAM	SAF	SAM	Total SAM	
—	5,959	—	11,549	—	5,946	—	845	—	5,819	52,066	.071
—	418	—	579	—	305	—	36	—	441	3,584	.033
.073	222	.272	258	.236	164	.142	17	.254	212	1,784	.040
.034	26	.126	33	.109	12	.066	2	.118	38	184	.009
.107	143	.400	263	.346	116	.209	15	.373	148	1,434	.063
—	2,182	—	5,952	—	2,446	—	468	—	1,727	19,754	.124
.199	1,527	.746	4,580	.647	1,782	.390	368	.697	916	14,370	.131
.136	315	.509	492	.441	260	.266	35	.475	553	2,549	.083
.109	2,302	.410	2,522	.356	2,197	.214	191	.383	1,827	17,945	.075
—	56	—	75	—	33	—	5	—	67	431	.013
.090	503	.339	938	.293	322	.177	47	.316	1,409	4,920	.037
—	498	—	1,483	—	645	—	98	—	348	5,432	.086
.172	399	.644	1,334	.558	462	.336	86	.601	252	4,517	.146
—	198	—	214	—	131	—	18	—	105	1,030	.062
—	13,098	—	82,569	—	12,781	—	3,503	—	11,892	214,696	.199
.234	1,162	.878	7,249	.761	1,254	.458	367	.819	1,245	19,147	.211
.240	11,932	.900	75,310	.780	11,523	.470	3,135	.840	10,645	195,519	.198
—	19,255	—	94,331	—	18,859	—	4,366	—	17,817	267,792	.146
—	857	—	1,567	—	673	—	103	—	2,257	12,247	.021
—	101	—	210	—	97	—	11	—	289	1,716	.018
.016	59	.211	102	.163	64	.099	7	.211	151	977	.025
—	—	—	—	—	—	—	—	—	—	—	—
.025	42	.323	108	.249	33	.151	5	.323	138	739	.039
—	223	—	317	—	181	—	30	—	386	2,308	.018
.017	149	.220	220	.170	116	.103	22	.220	170	1,473	.016
.020	58	.267	87	.206	55	.125	6	.267	203	727	.029
.014	313	.190	360	.147	207	.089	30	.190	517	4,156	.023
—	10	—	16	—	10	—	1	—	35	140	.005
.016	113	.217	275	.167	74	.102	10	.217	827	2,052	.018
—	98	—	389	—	104	—	20	—	203	1,877	.036
.038	85	.499	352	.385	89	.234	17	.499	167	1,671	.069
—	29	—	26	—	11	—	3	—	33	218	.015
—	5,343	—	32,706	—	3,657	—	1,253	—	7,170	95,562	.095
.054	386	.712	2,242	.550	312	.333	105	.712	532	6,631	.088
.060	4,957	.790	30,463	.610	3,345	.370	1,148	.790	6,638	88,928	.096
—	6,229	—	34,299	—	4,342	—	1,359	—	9,460	108,027	.067

[§]Smoking-attributable fraction.

^{||}Smoking-attributable mortality.

[†]Includes Falkland Islands.

^{**}Excludes Belize.

^{††}Includes Bermuda and St. Pierre and Miquelon.

Table 33. Adjusted estimates of smoking-attributable mortality (SAM) in the Americas, c. 1985

Region and country	Total SAM*	Chronic obstructive pulmonary disease [†]	Cancers [‡]	Other diseases [§] and causes	Total adjusted SAM
Latin America	64,300	18,600	1,400	13,800	98,100
Andean Area	5,300	1,700	10	1,200	8,200
Southern Cone	22,100	4,900	700	4,500	32,100
Brazil	22,100	5,400	300	4,600	32,400
Central America [¶]	600	200	10	100	900
Mexico	7,000	5,100	100	2,000	14,200
Latin Caribbean	7,300	1,300	200	1,400	10,200
Caribbean	1,200	300	30	300	1,900
North America	310,300	43,800	12,000	60,000	426,100
United States	284,400	39,800	11,000	55,000	390,200
Other ^{**}	25,800	4,100	1,000	5,100	36,000
All regions of the Americas	375,800	62,700	13,400	74,100	526,000

Source: Pan American Health Organization (1990b). Adjustments were based on 1985 estimates for the United States; U.S. Department of Health and Human Services (1989). Percentages used for upward adjustment for chronic obstructive pulmonary disease and other diseases and causes were specific to those diagnostic rubrics. Upward adjustment for cancers was based on lung cancer.

*Total for men and women from Table 32.

[†]230% adjustment to compensate for undercounting.

[‡]10.4% increase added to adjust for omission of cancers of the kidney and pancreas and for underestimates of smoking-attributable fraction for cancers of oral cavity, esophagus, and larynx.

[§]16.4% increase added to adjust for exclusion of cervical cancer, other types of cardiovascular and respiratory diseases, deaths among newborns due to smoking by the mother, lung cancer deaths due to passive smoking, and deaths from smoking-related fires.

^{||}Includes Falkland Islands.

[¶]Excludes Belize.

^{**}Includes Bermuda, Canada, and St. Pierre and Miquelon.

Conclusions

1. Certain sociodemographic phenomena—such as change in population structure, increasing urbanization, increased availability of education, and entry of women into the labor force—have increased the susceptibility of the population of Latin America and the Caribbean to smoking.
2. The lack of systematic surveillance information about the prevalence of smoking in most areas of Latin America and the Caribbean hinders comprehensive control efforts. Available information reflects a variety of survey methods, analytic schemes, and reporting formats.
3. Available data indicate that the median prevalence of smoking in Latin America and the Caribbean is 37 percent for men and 20 percent for women. Variation among countries is considerable, however, and smoking prevalence is 50 percent or more in some populations but less than 10 percent in others. In general, prevalence is highest in the urban areas of the more developed countries and is higher among men than among women.
4. The initiation of smoking (as measured by the prevalence of smoking among persons 20 to 24 years of age) exceeds 30 percent in selected urban areas. Although systematic time series are not available, the data suggest that more recent cohorts (especially of women) in the urban areas of more developed countries are adopting tobacco use at a higher rate than did their predecessors.
5. The smoking epidemic in Latin America and the Caribbean is not yet of long duration or high intensity, and the mortality burden imposed by smoking is smaller than that for North America. By 1985, an estimated minimum of 526,000 smoking-attributable deaths were occurring each year in all the countries of the Americas; 100,000 of these deaths occurred in Latin American and the Caribbean countries.
6. The estimate of 526,000 deaths annually is conservative and is best viewed as the first point on a continuum of such estimates. However, it provides an order of magnitude for the number of smoking-attributable deaths in the Americas.
7. The time lag between the onset of smoking and the onset of smoking-attributable disease is foreboding. In North America, a high prevalence of smoking, now declining, has been followed by an increasing burden of smoking-attributable morbidity and mortality. In Latin America and the Caribbean, rising prevalence portends a major burden of smoking-attributable disease.

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